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ABSTRACT

This article introduces a field-test model that was developed within a major curriculum-development effort in Turkey. Part of the National Educational Development Project, the model provides a systematic set of steps in piloting a newly developed curriculum in schools. Development involved three major phases--planning, implementation, and outcome--and required various activities like writing questions, determining the field-test sample, data collection and analysis, and report writing. The paper examines the process and outcomes of field testing a specific curriculum and discusses various issues regarding the use of the model. The model helped the curriculum-development committee and the Board of Education by providing them indicators of the effectiveness and appropriateness of the new curriculum through both quantitative and qualitative data. The findings from the study helped the curriculum-development committee make decisions about revisions, which strengthened the curriculum and brought it more in line with the needs and interests of the target population. The field-test process also helped the committee see how the curriculum was being implemented and what impact it had on students in terms of cognitive, affective, and psychomotor skills. Interviews and observations showed that different applications of the curriculum produced different results. (Contains 13 references.) (RJM)

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Assessing Newly Developed Course-Based Curriculum: A Field Test Model and Its Implementation in a Curriculum Development Project in Turkey

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Assessing Newly Developed Course-Based Curriculum: A Field Test Model and Its Implementation in a Curriculum Development Project in Turkey

ABSTRACT

This article introduces a field test model developed within a major curriculum development effort undertaken as part of the National Education Development Project in Turkey. This model aims to provide a systematic set of steps in piloting a newly developed curriculum in schools. Involving three major phases called planning, implementation and outcome, the field test model requires undertaking various activities like writing questions, determining field test sample, data collection and analysis, and report writing. In addition, this article examines the process and outcomes of field testing a specific curriculum, and discusses various issues regarding the use of the model.

Assessing Newly Developed Course-Based Curriculum: A Field Test Model and Its Implementation in a Curriculum Development Project in Turkey

Introduction

The national interest in improving the quality of education at different levels has generated various highly important movements to improve curriculum[1] at the primary and secondary-school level in Turkey. One of these movements has been initiated in the middle of 1990's as part the National Education Development Project, funded by the World Bank and the Turkish Government. Within this project, the curriculum development component aimed to critically examine all the curricula at the elementary and secondary-school level and improve them in accordance with new developments in the respective disciplines and with the changing needs of the students and the Turkish society. For this purpose various curriculum development committees were set up according to the subject areas and these committees carried out a set of activities ranging from needs assessment to developing the actual course curriculum. An important aspect of this process has been the effort to field test the newly developed curriculum to understand to what degree it is appropriate for the target population, effective and of good quality. Following a review of curriculum evaluation literature in relation to field testing and previous curriculum assessment efforts in Turkey, this article explains the model developed for field testing of the curriculum within this project and its application to a newly developed curriculum, namely Biology at the high school level.

Field testing of the curriculum is closely related to the curriculum evaluation efforts carried out for various purposes. The literature presents a variety of approaches to curriculum evaluation. Tyler (1949) defines curriculum evaluation as "the process of determining to what extent the educational objectives are actually being actually being realized by the program of curriculum and instruction" (p. 105-106). In Tyler's statement, there is an emphasis on outcomes. However, an overemphasis on outcomes may not be sufficient in making a decision whether the curriculum is of good quality. Even if we find that the curriculum is successful in reaching its aims that does not tell us anything about the quality of its objectives, the content covered and its organization, the implementation process, materials used and the assessment procedures. When new curricula in math and sciences were

[1] The term 'curriculum' in this article refers to the course curriculum developed centrally at the Ministry of National Education. Such curricula may differ greatly in terms of specificity, detail, framework and format.

introduced in the early 1990s as part of the credit system in high schools in Turkey, many questions were raised in terms of the quality of these curricula. Were the objectives appropriate for this group of students? Did they respond to the students' needs and interests? How appropriate was the content selection and organization? Was content selection done according to sound theoretical and practical principles? Were the schools and teachers prepared enough to teach these curricula effectively? Obviously these questions could not be answered sufficiently by evaluation that focused on the achievement of educational objectives.

Curriculum evaluation may focus on a variety of aspects of the curriculum. Stufflebeam (1983) suggests an evaluation model involving four aspects: context evaluation, input evaluation, process evaluation, and product evaluation. "Context evaluation" refers to the degree to which the needs arising from the context are being met and the information from this kind of evaluation is helpful in defining and revising the objectives in the curriculum. "Input evaluation" refers to resources and strategies used in implementation of the curriculum and in that respect this process may provide feedback to curriculum developers to see what additions and revisions need to be done in the curriculum. "Process evaluation" is related to how well the curriculum is implemented and produces information about the revisions that needs to be done in the curriculum to increase the possibility of curriculum success. Finally, "output evaluation" refers to results gained at the end of the implementation of the curriculum. Stufflebeam's consideration of all aspects of the curriculum and its implementation in evaluation has a wider scope than the evaluation concept offered by Tyler (1949) who mainly focused on the realization curriculum objectives. These four aspects of the evaluation are relevant in field testing efforts of new curriculum since they cover all the processes related to the implementation of the curriculum. Therefore, during field testing, the context, the input, the process and the output should be taken into consideration together since they all have a significant impact on the success of the curriculum.

Scriven (1967) makes a differentiation between two types of evaluation: Formative and summative. "Formative evaluation" is conducted during the implementation of a curriculum to provide curriculum developers information useful in assessing different aspects of the curriculum and improving these aspects accordingly. The concept of formative evaluation is

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These differences mostly arise from the curriculum development approach adapted and specific features of the respective course and the grade level the curriculum is intended for.

closely related to the concept of field testing since immediate feedback can be given to curriculum developers based on the actual implementation of the curriculum in a sample of classrooms, then this feedback can be used to make necessary revisions and additions in the curriculum. "Summative evaluation" is carried out at the end of the implementation of the curriculum to come up with a judgment about the quality of the curriculum based on certain criteria. The concept of summative evaluation is also important in the process of field testing new curriculum since this process helps the curriculum developers, policy makers and the practitioners make a decision about the suitability and effectiveness of the new curriculum so that the new curriculum can be put into practice on a wide scale in all schools. As a results both formative and summative evaluation approaches should be taken into consideration in field testing a new curriculum since formative evaluation leads to decisions about further improvements in the curriculum and summative evaluation leads to an overall decision on program suitability and expansion.

Sirotnik (1987) suggest that curriculum evaluation should include a thorough examination of curriculum activities, processes and outcomes at various levels (personal, instructional, institutional and social) and should use various data sources (teachers, students, administrators, observations, documents, etc.). In field testing of new curriculum, teachers who actually implement it are the key data sources. Since teachers are the ones who experience the curriculum first hand, carry out a variety of activities to achieve the objectives of the curriculum, see the difficulties and inconsistencies, observe students' understanding, they can provide valuable information as to the quality of the curriculum. Therefore, "...the teacher's role must be regarded as central in the evaluation activities ..." (Madaus, & Kellaghan, 1992, p. 126).

Previous Curriculum Assessment Efforts in Turkey

Curriculum development largely occurs at the Ministry of National Education (MONE) level in Turkey. Various bodies of the MONE -- Primary Education Directorate, Secondary Education Directorate, Vocational Education Directorate, Education Research and Development Directorate are a few to name -- may develop curriculum through a curriculum committee they form. The curriculum developed has to be approved by the Board of Education's executive council before it can be implemented nationwide in primary and secondary schools. The centralized nature of the educational system dictates that all teachers

in the same subject area in elementary and secondary schools follow the same curriculum developed centrally at the MONE. Teachers develop yearly, unit and lesson plans for their own use based on the standard curriculum guide, and these plans are approved by the school administration. One of the important functions of the school inspectors is to oversee the implementation of the curriculum in schools, and the instructional plans produced by the individual teachers.

Field testing of the newly developed curriculum through a systematic model is a new concept for the MONE in Turkey. Much of the previous assessment of elementary and secondary-school level curricula prior to their implementation at large scale has been conducted through various Ministerial bodies, and curriculum and subject matter experts at the universities in terms of their appropriateness for the respective grade level and their reflection of new developments in the respective disciplines. For example, when a primary school science curriculum is developed by a commission at the Primary Education Directorate, it is sent to other directorates (Board of Education, Secondary Education Directorate, etc.). These bodies of the MONE review the curriculum through an ad-hoc committee involving senior subject matter teachers and officials in charge of curriculum and instruction at the primary school level. The curriculum is also sent to the MONE's Board of Inspectors. Here again, a commission is formed to assess the new curriculum based on the experiences with the previous curriculum. In addition, Board of Education may request several university professors in the subject area to examine the curriculum. The assessment reports of these parties are taken into consideration in revising the curriculum and the final product is submitted to the executive council of Board of Education for approval. Once the Board of Education council approves the curriculum it is sent to schools nationwide and implemented by all teachers in the subject area. The implementation of the curriculum is overseen regularly by the Ministry inspectors.

The previous assessment process summarized above does not include any field testing of the newly developed curriculum in schools. In most cases, the new curriculum is expected or assumed to be appropriate for all schools nationwide. However, this may not be the case! The teachers who implement the curriculum may face certain difficulties in terms of its applicability in their own classrooms. Surveys of the implementation of various curricula at the elementary and secondary school-level have indicated that teachers complain about various aspects of the curriculum in their subject area. First of all, the objectives for the course are mostly idealistic and they do not specify course related outcomes. Second, the

number of units is too many to be covered in a semester. Third, the sequence of the units is sometimes not suitable for developing student understanding of the important concepts and ideas. Finally, the materials and assessment procedures specified in the curriculum do not work well (Boran, 1985; Yalcin, 1985; Yildirim, 1997). In summary, teachers have to deal with many problems that arise from the specific aspects of the curriculum. Since the teachers have very little flexibility in terms of the scope and sequence in their subject areas, the new curricula must be developed very carefully and be piloted before they are implemented nationwide. Such a piloting may help the curriculum developers understand how appropriate and effective the new curriculum is and revise if necessary based on the feedback from teachers and students.

The previous efforts to assess new curriculum by the MONE are similar to expertise-oriented evaluation approach, which primarily depends on professional expertise to judge a curriculum (Worthen and Sanders, 1987). In this approach, curriculum or subject matter experts assess the worth of a curriculum through examining its objectives, content, underlying theory and the suitability for the student age group it is intended for. This reliance on professional expertise can be a sign of seeing teachers merely technicians who apply the curriculum decided by a group of experts at upper layers of the educational system. The evaluation of the new curriculum through expert judgment of individuals and institutions has been insufficient in several respects. The expert judgment may be myopic without actual implementation of the curriculum in schools. The curriculum may look well designed, however, the actual implementation determine its real use, suitability and effectiveness. Without having feedback from the actual implementation, opportunities to revise and improve further may be missed. Therefore, field testing of the curriculum seems to be a critical issue in curriculum development efforts undertaken.

The Field Test Model

The field test model, developed by the author of this article, has three important stages: planning, implementation and outcome. "Planning stage" involves determining field test purpose, field test questions and field test sample, inservice training to introduce the curriculum, and planning data collection. "Implementation stage" consists of collecting and analyzing data. Finally, "outcome stage" involves producing a final report based on the field

test planning and implementation. Figure 1 presents these main stages and the steps followed to carry out a field test. Below, each of these steps are described in more detail.

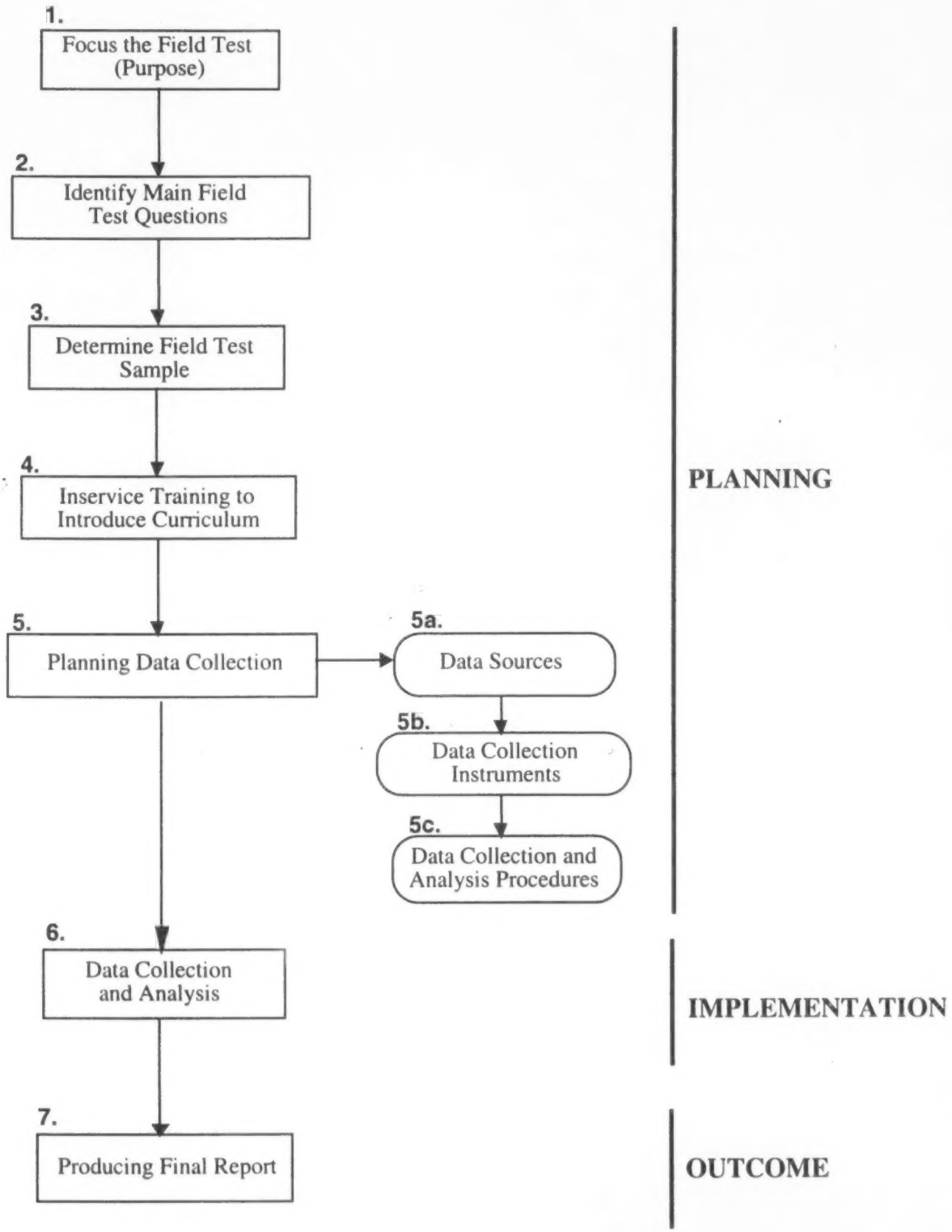
1. Focusing the Field Test (Purpose)

The first step involves determining the purpose of the field test. There might be two purposes in field testing a curriculum, The first one is to determine the degree to which the curriculum objectives are reached at the end of the implementation. This purpose is similar to summative approach described above, and it is appropriate if the curriculum is developed with the sole purpose of improving student achievement. The second purpose is about testing all aspects of the curriculum and producing suggestions to revise and strengthen the curriculum. This purpose involves both formative and summative approaches, and it is preferred when the curriculum is developed to update various aspects of the curriculum (content, materials, etc.). In order to determine the basic purpose for field testing, first the reasons for developing the curriculum should be examined. For this purpose the curriculum development committee may be consulted and their needs assessment reports may be studied.

2. Identifying the Field Test Questions

Based on the field test purpose and the main aspects of the new curriculum, field test questions are identified. These questions are like specific research questions in a study and guide the field test process, especially in preparation of data collection instruments. Field test questions may cover issues like the suitability of objectives and content for the student background and the requirements of the discipline, suitability of the content and materials in reaching the objectives, effectiveness of the teaching and learning activities, value of evaluation procedures for teachers, consistency of various parts of the curriculum, needed additions or revisions, comparison with the old curriculum, strengths and weaknesses of the curriculum. These questions focus on both specific aspects of the curriculum as well as the curriculum as a whole. In other words, field test questions identify the main areas to be examined through the field test of the curriculum.

Figure 1. Field Test Model



3. Determining the Field Test Sample

A group of classrooms or schools are determined to field test the curriculum. If the curriculum is to be implemented nationwide, then a sample of schools to represent all the schools in the country would be selected. If the curriculum is developed only for a specific school or a limited number of schools (e.g., commercial high schools), then a sample of schools or classrooms would be appropriate to serve for field testing the curriculum. For field testing a curriculum to be implemented nationwide, certain criteria may be used to represent all the relevant schools in the country. For example, representation of geographical regions, of big and small cities, of large and small schools might be some of these criteria. It is important to include in this sample the schools which have adequate personnel and physical facilities to implement the curriculum.

4. Inservice Training to Introduce the Curriculum

The teachers and administrators of the sample schools need to be invited to an inservice education program to introduce the curriculum and go over important strategies and details to implement the new curriculum. If the school sample is large, then only one teacher from each school may be included in the inservice training. Then these teachers serve as trainers to introduce the curriculum to the teachers in their own schools. If the school sample is small, then all teachers in the respective subject area may be trained in the inservice education program. In addition to introducing the new curriculum, the inservice education should help teachers understand the concept of field testing and their responsibilities during this process.

5. Planning Data Collection

Planning for data collection involves three stages: determining the data sources, developing data collection instruments and planning data collection and analysis.

5a. Determining data sources. What information sources should we use during and at the end of field testing the new curriculum? This is the basic question at this stage. First of all teachers should be the most important sources since they are the ones who experience the curriculum first hand and who see the impact of the curriculum on students. Students are also important data sources in deciding about a curriculum in many aspects since they are the ones who are directly and indirectly influenced by what the curriculum offers. In addition, school administrators and parents might be important data sources even though they are influenced

by the curriculum indirectly. The decision on who to include as data sources will depend on the resources available for field testing the curriculum. The cost of field testing, number of personnel in carrying out the field testing and the time available are taken into consideration in deciding the kind and size of the data sources. In addition to human sources, observations and documents may serve as important data sources. Observations in the classrooms can be carried out to see the implementation of the curriculum first hand. Various kinds of instructional plans (yearly, unit and daily), assignments, projects, exams, etc. may also provide rich information about the implementation of the new curriculum.

5b. Development of data collection instruments. Questionnaires, interview and observation forms, unit tests, document analysis forms are just few of the data collection instruments that might be employed in gathering data about the implementation of the new curriculum. During development of data collection instruments, main field test questions decided earlier should serve as a framework. In addition, the curriculum development committee should feed into the development of data collection instruments since they are the ones who essentially will use the information to be produced during and at the end of field testing toward improving the curriculum further. Both qualitative and quantitative data collection methods can be used for field testing. Quantitative methods would be helpful in reaching a large number of data sources and producing generalizable data whereas qualitative methods would produce in-depth and detailed explanations as to various aspects of the curriculum and how these aspects are experienced in the field. In addition, the data collected through various data collection methods may be triangulated to validate and explain the conclusions reached (Jick, 1979; Mathison, 1988). Data collection instruments should be piloted with a small group of subjects, classrooms or documents before they are given their final form.

5c. Planning data collection and analysis process. A data collection plan is essential in making best use of resources available for field testing. The schools implementing the new curriculum should be informed about the data collection plan so they can prepare for data collection activities in advance. This plan includes a time framework for the questionnaire administration, carrying out observations and interviews, administering unit tests, and so on. In addition, in this stage appropriate data analysis techniques are determined based on the data collection methods to be used in order to analyze data both during and at the end of field

testing of the new curriculum. Formative evaluation of the curriculum necessitates on-going analysis of the data, and in field testing this analysis is particularly helpful since it will feed significant data to the curriculum development committee with regard to the revisions needed in the curriculum. For quantitative data, both descriptive and inferential statistics can be used while qualitative data collected through interviews, observations and documents can be subjected to content analysis which involves coding, categorizing and drawing conclusions (Miles and Huberman, 1994, Patton, 1990).

6. Data collection and analysis. Based on the plans made prior to this stage, data are collected and analyzed. This stage is the implementation stage of the field test process. Data collection needs to be supervised closely. Data analysis results are fed back to the curriculum development committee as interim reports.

7. Producing the final report. In this stage, also called outcome stage, overall process for field testing and its results are reported. This report includes field test plans (field test questions, the sample, data collection instruments, procedures and so on) along with the results of field test process. The data collected through different data collection instruments are reported based on the field test questions decided earlier. In addition this report should include a section on the revisions and additions in the new curriculum made as a result of the field testing process. Finally this report may provide some suggestions about the implementation of the new curriculum.

Field Testing Biology Curriculum

The High School Biology Curriculum Guide was developed by a committee formed by the MONE's Educational Research and Development Directorate in 1995 as part of the National Education Development Project. The curriculum development committee included subject matter teachers, university professors in the field, curriculum development specialists. In addition, measurement and material specialists were consulted occasionally about certain aspects of the curriculum. Based on a needs assessment in the area, a comprehensive review of the old curriculum and various curricula in developed countries, the committee initiated a intensive effort to design a new curriculum guide for high school Biology course. The committee worked on the new curriculum for about one year and produced a draft curriculum to be field tested. The curriculum guide for Biology included an introductory section

addressing the teachers on various aspects of the new curriculum and suggestions on its implementation, general and specific objectives of the course, topical outline, unit plans for each of the topics covered, and experiments suggested for teaching some of the units. Each unit plan included specific objectives of the unit, approximate class time to be devoted to the unit, the topics and subtopics to be covered in the unit, activities and strategies for teaching the unit, assessment strategies for student learning, the teaching materials and experiments if appropriate, and finally new concepts introduced by the unit and their definitions.

This draft curriculum reflected a new approach to centralized curriculum development efforts in Turkey. The new approach involves a systematic effort to analyze and consider the students' and society's needs and the new developments in the area. Active learning and relating knowledge to daily life are the driving forces in designing new curriculum. In addition, not only subject matter experts but also curriculum developments specialists, measurement and educational technology specialists, subject matter teachers are involved in the curriculum development process. The new model also requires designing detailed unit plans involving specific objectives, topics, instructional activities, materials, evaluation procedures and terms. Biology curriculum was one of the first few curricula developed based on this new curriculum development approach, and in this sense it was important to see how it was received by the teachers and students in schools.

After the draft curriculum guideline was developed, a field test group was formed. The author of this paper acted as the major consultant in the field test group, and five curriculum development committee members were involved in data collection and analysis stages. The field testing of the Biology Curriculum Guide included 34 high schools and lasted for one semester during 1995-96 academic year. As a result of field testing, a rich set of conclusions were produced and these conclusions were used both to revise the curriculum and make a decision about its effectiveness and quality. Both formative and summative evaluation approaches were used in field testing process which includes focusing the field test, identifying field test questions, determining the field test sample, introducing the curriculum to the teachers in the sample schools, planning and carrying out data collection and analysis, and finally writing the final field test report. These stages are discussed in more detail below. Then the results of the field testing are summarized.

Purpose

Three purposes guided the development of new Biology curriculum (grade 9): updating the course content, making the course more meaningful and interesting for students, and relating the course to daily life. These purposes also guided the field testing of the curriculum in selected schools. Therefore, the field test aimed to answer the following specific questions:

1. How effective is the curriculum in reflecting new developments and knowledge in the area?
2. How meaningful and interesting is the curriculum is for students?
3. To what degree is the course content related to the daily life of students?

In addition to answering these questions, the field test also aimed to provide in-depth and detailed explanations as to how and why this curriculum was effective or not, and in what respects the curriculum needed to be revised and improved further.

Field Test Questions

Based on the field test purpose and the main aspects of the Biology Curriculum, 11 field test questions which focused on both specific aspects of the curriculum as well as the curriculum as a whole were identified. These questions are listed below.

1. How suitable are the general and specific objectives of Biology Curriculum?
2. How suitable are the units and topics of Biology Curriculum?
3. How suitable are the teaching and learning activities of Biology Curriculum?
4. How suitable are teaching and learning materials of Biology Curriculum?
5. How suitable are the evaluation procedures of Biology Curriculum?
6. How suitable are the terms and concepts of Biology Curriculum?
7. To what degree does Biology Curriculum as a whole reach its purposes?
8. How effective is Biology Curriculum in assisting the teacher in teaching and learning process?
9. How effective is Biology Curriculum in leading students to interesting and meaningful learning experiences?
10. To what degree does Biology Curriculum help students relate what they learn to daily life?
11. What aspects of Biology Curriculum need to be revised and improved further?

Although these main questions provided an overall framework for field test process, they were not specific enough to give direction to designing data collection instruments like

questionnaires and interview forms. Therefore, more specific questions were developed for various aspects of the curriculum such as objectives, units, teaching and learning activities, materials, assessment strategies, student activities (e.g., experiments), new concepts and terms. As a results, a total of 53 specific field test questions were written. Four of these questions addressing the unit objectives were listed below as an example.

1. How appropriate are the objectives of the Biology Curriculum for the respective student population?
2. Are there any objectives that need to be added to the curriculum?
3. Are the objectives written clearly?
4. How helpful are the objectives for the teachers in planning and implementing instructional activities?

These specific questions served as a guideline for data collection in various ways. First of all, these questions were reflected in questionnaire items, interview questions and observation dimensions. Second, these questions were given to the teachers who implemented the new curriculum throughout the field test period and they were asked to write group reports on the new curriculum using these questions as a framework. Finally these questions helped the field test committee analyze the data collected in the field and write the final field test report.

Field Test Sample

In the field test study of Biology curriculum, teachers and students who went through the new curriculum for one semester in the 34 high schools in 15 provinces formed the main data sources. These 34 schools were selected from among a total of 84 high schools in various parts of the country designated as experimental schools by the Ministry of Education specifically for testing newly developed curricula and trying out "new approaches" in education. In selecting 34 high schools for field testing Biology curriculum, a stratified random selection technique was used to represent both big and small city high schools in seven geographical regions of the country.

Inservice Seminar

All Biology teachers from the 34 high schools chosen for field testing the curriculum (N=109) were invited to an inservice education seminar to introduce the new curriculum and

go over important strategies and details to implement it. In addition, the participants were briefed about the field test process and their responsibilities during this process. The seminar lasted for two weeks.

Data Sources

When the new Biology curriculum implemented (1995-96 academic year – first semester) there were a total of 109 Biology teachers in the 34 high schools selected for field test study. All these teachers were included in the data collection sample. A systematic sampling technique was used to select a group of students in these schools for data collection. There were a total of 12.407 students who were subjected to the new curriculum and only the first 10 students in each section of the Biology course in each high school were asked to participate in the study. As a result, a total of 103 Biology teachers and 1820 students who responded to the questionnaires formed the sample of this field test study.

In addition, a subsample from this overall sample was determined for interviews and observations. For convenience, four high schools in Ankara were selected for this phase of the field test study and a total of 23 teachers and 106 students in these four schools served as the subsample for interviews and observations. Individual interviews with teachers and group interviews with students (5-6 in each group) were carried out. A total of 13 class sessions were observed.

Furthermore, instructional plans (yearly, unit and lesson) developed by the teachers in the sample, class notes and materials prepared by teachers, and departmental reports on the curriculum served as essential data sources as well.

Data Collection Instruments

Questionnaires and interview forms were developed to collect data from teachers and students on the new Biology curriculum. In addition, an observation form was designed to carry out observations in classes to see first hand the implementation of the curriculum. Finally, field test questions for use in writing departmental reports on the curriculum were prepared. In developing all the data collection instruments, field test questions determined earlier served as a framework.

Questionnaires for teachers included questions on specific dimensions of the new Biology curriculum such as objectives, units, topics and subtopics, teaching and learning activities, materials, evaluation activities as well as general aspects of the curriculum.

Student questionnaires focused on topics, implementation, evaluation and the textbook as well as the value they attach the Biology course, its impact in terms of knowledge and attitudes. Interview questions also focused on various aspects of the new curriculum in line with the questionnaires. Observation form aimed to provide a visual description of the implementation of the curriculum and thereby focused on teaching and learning activities used in classes and students' reactions toward various aspects of this implementation. Within this framework, aspects like how the lesson is perceived by the students, their participation, difficulties they go through were focused upon. Finally, the list of questions prepared to give direction to departmental reports on the curriculum included field test questions.

Almost half of the questionnaire items were open ended. In addition interview questions were all open ended. So in that sense both qualitative and quantitative data collection methods were used. Close ended questions helped the curriculum development committee to see the general trends among the teachers and students with respect to various aspects of the curriculum whereas open ended questions provided detailed descriptions and in-depth understanding regarding the implementation of the curriculum. Observation data provided additional descriptive data on the implementation of the new curriculum and allowed the curriculum development committee to triangulate various data to reach some meaningful patterns (Jick, 1979; Mathison, 1988) and make informed decisions on revisions in the curriculum. Questionnaires were piloted in four schools in Ankara with 12 teachers and 60 students. In addition teachers interview form was tried out with four teachers and student interview forms with three groups of students. Finally observation forms were used in two class sessions. Based on these pilot implementations, various revisions and additions were made in all three data collection instruments.

Data Collection and Analysis

A data collection plan was prepared to collect both quantitative and qualitative data in a timely manner. An official letter from the Ministry of Education was sent to all 34 high schools implementing the new curriculum to ask for assistance in securing the administration of the teacher and student questionnaires and preparation of departmental reports. In addition, four schools in Ankara were informed about the data collection plan for observations and interviews.

Based on these initial correspondence, questionnaires were mailed to schools, and one Biology teacher was asked to act as a coordinator in administering the teacher and student

questionnaires and send them back to field test group located in Ankara. In addition, these school coordinators acted as facilitators in writing the departmental reports. A total of 103 teacher questionnaires and 1820 students responded to the questionnaires. A total of 30 departmental reports were received from the field test schools.

Interviews and observations were carried out in four field test schools located in Ankara. A total of 23 teachers and 106 students participated in the interviews. A total of 13 observations were carried out in Biology classes. All interviews were tape recorded and notes were taken during observations.

The questionnaire data were subjected to descriptive analysis to explore the trends among the teachers and students regarding various aspects of the curriculum. The departmental reports, and interview and observation data were subjected to content analysis. In this process the data were coded and the patterns were explored. As a result rich descriptions of the curriculum implementation, and strengths and weaknesses of the curriculum were gained.

Results

The results of the field test showed that new Biology Curriculum was effective in leading students to learning updated knowledge with an emphasis on active learning, in relating knowledge to daily life and in producing interest toward Biology in students. The questionnaire results indicated that teachers were generally satisfied with the content and format of the new curriculum. First of all, the content was updated in line with new developments in the field. New topics like "biotechnology," "environmental pollution" and "genetic engineering" were perceived as necessary and significant topics in the new curriculum. Second, the sequence of the units was generally approved as appropriate and effective. Third, unit plans helped the teachers plan their instructional activities. These unit plans were used as guidelines in their daily lesson plans as well. Fourth, the experiments, instructional materials , terms and concepts were also found effective by the teachers. In addition to the comments on the quality of the new curriculum, some suggestions with regard to changes in the curriculum were also made. These suggested changes in the curriculum were reported in interim reports written by the field test group based on the initial analysis on the data, and were forwarded to the curriculum development committee for assessment. Overall the committee found these suggestions quite helpful in revising the curriculum further and giving it a better shape.

A final report was written on field testing the new Biology Curriculum. This report confirmed the effectiveness of the curriculum and outlined the areas that needed more attention in the curriculum. This report helped the curriculum development committee to go over the curriculum with a perspective from the field and make some revisions accordingly. Field test led to revisions in the curriculum to decrease unnecessary details in some of the units; objectives and instructional activities were changed accordingly; teaching and learning activities were enriched to equip teachers with more examples and strategies; the terms and evaluation activities were revised. The final form of the curriculum was submitted to the Board of Education of the Ministry of Education, responsible for approving new curriculum and textbooks to be used in the nation's schools. The curriculum was approved and now it is in use in nation's high schools.

Discussion

Field testing the new Biology Curriculum based on the field test model developed earlier lasted for one academic semester. Data analysis and the final write up took another semester time. This process has shown that the pilot implementation of a new curriculum is an inseparable part of the curriculum development process. Through the trial implementation many aspects of the curriculum were checked by the direct recipients of the curriculum, teachers and students, and were validated in practice. Important decisions on revisions in the curriculum were made based on the recipients' suggestions. As a result the curriculum appeared to be more effective and suitable for the target population after the revisions.

The field test has shown that it is important to collect data from the direct recipients of the curriculum. As Madaus and Kellaghan (1992) argued, teachers should be the key source in assessing a curriculum since they experience it first hand. In addition to teachers, students can also provide useful information since they can easily report difficulties and inconsistencies they experience in the curriculum. Validating these points, both teachers and students provided important data on the effectiveness and suitability of the curriculum through their perspective. The implementation process helped them to see the curriculum in action, and the impact they feel based on the implementation process. Teachers were able to compare the new curriculum with the old one, and this comparison also assisted them in making a decision about the worth of the new curriculum.

In addition, the field test process has shown that it is important to collect both quantitative and qualitative data. Serving as summative assessment, quantitative data allowed the curriculum development committee to see the general trends among the teachers and students with regard to various aspects of the curriculum. For example, it was possible to see the percentage of the teachers who found the curriculum more effective than the old one. On the other hand, qualitative data provided in-depth descriptions of the implementation process (through observations) as well as detailed explanations to "why" and "how" questions, and assisted the field test group to make both formative and summative assessment of the curriculum. This type of data allowed the committee to see why certain topics were well received or not well received by the teachers and/or students. Triangulation of the findings through different types of data (Jick, 1979; Mathison, 1988) increased the validity of the field test process.

Overall the field test findings helped the curriculum development committee and the Board of Education in several ways. First they provided some indications with regard to the effectiveness and appropriateness of the new curriculum through both quantitative and qualitative data. The majority of the teachers and students indicated that the new curriculum is effective and suitable to their needs and interests. Second the findings helped the curriculum development committee make decisions about the revisions they need to make in the curriculum. These revisions strengthened the curriculum and brought the curriculum more in line with the needs and interests of the target population. Third the field test process helped the committee see how the curriculum is being implemented and what impact it has on students in terms of cognitive, affective and psychomotor skills. Especially interviews and observations showed that different applications of the curriculum produced different results, implicating that how teachers perceive the curriculum and how they implement it become very significant in the process. Based on good examples of instructional activities, the committee enriched the instructional activities sections of each unit.

The field test model described above and used in piloting a new curriculum appears to reflect most of the concepts Stufflebeam (1983) highlighted as important in curriculum evaluation. The first concept, "context," is taken into consideration as piloting of the new curriculum is done in natural settings and the results of the field test are interpreted within this context. The second concept, "input," is an essential part of field test process since the content, resources and strategies of the new curriculum are tried out in the field. The third concept, "process," is also a significant part of field test as the implementation of the new

curriculum provides essential insights into the potential use of the curriculum in various ways. Finally, the concept of "output" is reflected in the data collected from teachers and students on impact of the curriculum in various aspects like cognitive, affective and psychomotor skills.

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